AMENDMENTS TO THE CLAIMS

1-118 Canceled

119. (NEW) A method for enzymatically synthesizing a functionalized polymer comprising:

coupling an antioxidant to each of a plurality of monomers; and,

enzymatically polymerizing the antioxidant-coupled monomers to form an antioxidant-coupled functionalized polymer;

whereby the resultant functionalized polymer has inherent antioxidant capabilities.

120. (NEW) The method of claim 119, wherein the step of coupling an antioxidant to each of a plurality of monomers is carried out such that the resultant polymer has at least 1% of its monomeric units functionalized with antioxidants.

121. (NEW) The method of claim 119, wherein the step of coupling an antioxidant to each of a plurality of monomers is carried out such that the resultant polymer has at least 10% of its monomeric units functionalized with antioxidants.

122. (NEW) The method of claim 119, wherein the method further comprises coupling at least one antioxidant per monomer.

123. (NEW) The method of claim 119, wherein the method further comprises selecting a monomer from the group consisting of vinylbenzoic acid, amino acids, amino acid derivatives, carbohydrates, lactones, lactides, cyclic carbonates, esters, olefins, amides, urethanes, acrylides, vinyl monomers, vinyl ethers, acetals, aryl sulfones, ether sulfones, imides, etherketones, phenylene oxides, phenylene sulfides, carbonates, epoxides, phenolics, aminoplasts, sophorolactones, nucleosides, and dendrimers.

124. (NEW) The method of claim 119, wherein the step of coupling an antioxidant to each of a plurality of monomers further comprises using an enzyme.

125. (NEW) The method of claim 124, wherein the step of coupling an antioxidant to each of a plurality of monomers further comprises selectively acylating primary hydroxyl groups.

126. (NEW) The method of claim 124, wherein the method further comprises enzymatically coupling a primary hydroxyl group of the antioxidant to the monomer.

127. (NEW) The method of claim 124, wherein the step of enzymatically coupling an antioxidant to each of a plurality of monomers further comprises selecting an enzyme from the group consisting of proteases, glycosidases, and lipases.

128. (NEW) The method of claim 124, wherein the method further comprises utilizing *Candida antarctica* lipase.

129. (NEW) The method of claim 119, wherein the method further comprises selecting the antioxidant from the group consisting of ascorbic acids, vitamin E derivatives, tocols, α-tocopherols, β-tocopherols, γ-tocopherols, φ-tocopherols, ε-tocopherols, ξ1-tocopherols, ξ2-tocopherols, η-tocopherols, vitamin B derivatives, thiamines, cyanocobalamins, ergocalciferols, cholecalciferols, vitamin K derivatives, phytonadiones, menaquinones, quercetins, vitamin A derivatives, retinols, retinals, 3,4-didehydroretinols, α-carotenes, β-carotenes, δ-carotenes, γ-carotenes, cryptoxanthins, citric acid, butylated hydroxyanisoles, butylated hydroxytoluenes, alpha-lipoic acids, glutathiones, carotenoids, allylic sulfides, selegilines, N-actylcysteines, lecithins, tartaric acids, caffeic acids, diaryl amines, thioethers, quinones, tannins, xanthenes, procyanidins, porphrins, phenolphthaleins, indophenol, coumarins, flavones, flavanones, and isomers, derivatives, and combinations thereof.

130. (NEW) The method of claim 119, wherein the step of coupling an antioxidant to each of a plurality of monomers further comprises coupling ascorbic acid to the monomers.

131. (NEW) The method of claim 119, wherein the method of enzymatically polymerizing the antioxidant-coupled monomers further comprises using horseradish peroxidase (HRP).

132. (NEW) The method of claim 119, wherein the method further comprises casting the polymer into a shaped form.

133. (NEW) The method of claim 132, wherein the form is selected from the group consisting of films, fibers, coatings, sheets, tubes and combinations thereof.

134. (NEW) The method of claim 119, wherein the method further comprises selecting a monomer that is biodegradable.

135. (NEW) The method of claim 119, wherein the method further comprises selecting biodegradable monomers from the group consisting of polyesters, glycolides, lactides, trimethylene carbonates, caprolactones, dioxanone, hydroxybutyrates, hydroxyvalerates, carbonates, amino acids, "pseudo" amino acids, esteramides, anhydrides, orthoesters, sophorolactones, nucleosides, dendrimers, and combinations thereof.

136. (NEW) The method of claim 119, wherein the method further comprises selecting a single type of monomer and the step of polymerizing the antioxidant-coupled monomers into an antioxidant-coupled polymer further comprises forming an antioxidant-coupled homopolymer.

137. (NEW) The method of claim 119, wherein the method further comprises selecting a plurality of different monomers and the step of polymerizing the antioxidant-coupled monomers into an antioxidant-coupled polymer further comprises forming an antioxidant-coupled copolymer.

138. (NEW) A method of protecting an oxygen sensitive material from degradation comprising:

coupling an antioxidant to each of a plurality of monomers;

enzymatically polymerizing the antioxidant-coupled monomers to form an antioxidant-coupled polymer; and,

surrounding the material within the antioxidant-coupled polymer,

whereby the antioxidant-coupled polymer scavenges free radicals so as to protect material from oxygen degradation.

139. (NEW) The method of claim 138, wherein the step of coupling an antioxidant to each of a plurality of monomers further comprises using an enzyme.

140. (NEW) The method of claim 138, wherein the method further comprises selectively acylating a primary hydroxyl group of the antioxidant.

141. (NEW) The method of claim 138, wherein the method further comprises housing oxygen sensitive material in direct contact with the shaped form.

142. (NEW) The method of claim 138, wherein the method further comprises forming a packaging for foodstuff, wherein the antioxidant coupled polymer is in direct contact with the foodstuff.

143. (NEW) The method of claim 138, wherein the method further comprises coating a pharmaceutical agent with the antioxidant coupled polymer.

144. (NEW) The method of claim 138, wherein the method further comprises applying a second oxygen impermeable packaging material coating the antioxidant coupled polymer, distal to the oxygen sensitive material.

145. (NEW) The method of claim 138, wherein the method further comprises utilizing biodegradable monomers.

146. (NEW) The method of claim 138, wherein the method further comprises implanting the antioxidant-coupled polymer into a subject.

147. (NEW) A medical device having at least one surface coated with a polymer comprising monomeric units functionalized with antioxidants, the polymer formed by coupling the antioxidants to each of a plurality of monomeric units to form antioxidant-coupled monomeric units and enzymatically polymerizing the antioxidant-coupled monomeric units,

whereby the polymer coated medical device scavenges free radicals so as to protect oxygen sensitive materials from oxygen degradation.

148. (NEW) The medical device of claim 147, wherein the medical device is an implantable medical device selected from the group consisting of dialysis apparatus, stents, filtration apparatus, catheters, sutures, tubings, syringes, endoscopes, and prostheses.

149. (NEW) The medical device of claim 147, wherein the antioxidant functionalized polymer coats a medical device, such that the antioxidant-coupled polymer is in direct contact with oxygen sensitive materials.

150. (NEW) The medical device of claim 147, wherein a second oxygen impermeable material coats the antioxidant-coupled polymer, distal to the oxygen sensitive material.

151. (NEW) The medical device of claim 147, wherein the monomeric units are biodegradable monomers.

152. (NEW) The medical device of claim 147, wherein at least 1% of its monomeric units are functionalized with antioxidants.

153. (NEW) An antioxidant coupled packaging material comprising,

a first film layer cast from a polymer with monomeric units functionalized with an antioxidant, the polymer formed by coupling the antioxidant to each of a plurality of monomeric units to form antioxidant-coupled monomeric units and enzymatically polymerizing the antioxidant-coupled monomeric units; and,

a second barrier film layer,

such that the first layer encases a material and the second layer is oxygen impermeable.

154. (NEW) A controlled delivery system for antioxidants comprising

an antioxidant bound to a biodegradable polymer composed of biodegradable monomers, the biodegradable polymer formed by coupling the antioxidant to each of a plurality of biodegradable monomers to form antioxidant-coupled biodegradable monomers and enzymatically polymerizing the antioxidant-coupled biodegradable monomers, wherein the antioxidant is present in an amount from about 20% to about 80% (w/w).

155. (NEW) The controlled delivery system of claim 154, wherein the antioxidant-coupled polymer comprises a topical ointment.

156. (NEW) A method of controlled delivery of an antioxidant to a subject comprising

coupling an antioxidant to each of a plurality of biodegradable monomers; and

enzymatically polymerizing the antioxidant-coupled biodegradable monomers;

whereby the resultant antioxidant coupled polymer will degrade over time and deliver the antioxidant at a controlled rate to a subject.

157. (NEW) The method of claim 156, wherein the method further comprises coupling at least 70% of the resultant polymer's monomer units with antioxidants.

158. (NEW) The method of claim 156, wherein the step of coupling an antioxidant to each of a plurality of biodegradable monomers further comprises utilizing an enzyme.

159. (NEW) The method of claim 158, wherein the method further comprises selectively acylating a primary hydroxyl group of the antioxidant.

160. (NEW) The method of claim 158, wherein the step of enzymatically coupling an antioxidant to each of a plurality of monomers further comprises utilizing a lipase.

161. (NEW) The method of claim 156, wherein the step of polymerizing the antioxidant-coupled monomers further comprises using the enzyme horseradish peroxidase (HRP).

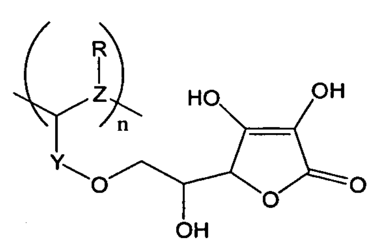
162. (NEW) The method of claim 156, wherein the method further comprises casting the antioxidant-coupled polymer into a shaped form selected from the group consisting of a film, a fiber, a coating, a sheet, and combinations thereof.

163. (NEW) The method of claim 162, wherein the method further comprises housing oxygen sensitive material in direct contact with the shaped form.

164. (NEW) The method of claim 156, wherein the method further comprises coating a pharmaceutical agent with the antioxidant-coupled biodegradable polymer.

165. (NEW) The method of claim 156, wherein the method further comprises embedding a pharmaceutical agent within the antioxidant-coupled biodegradable polymer.

166. (NEW) An ascorbyl coupled polymer with inherent antioxidant activity comprising functionalized units of formula:



wherein Y is absent, C_2H_2O, C_7H_4O or a linking group;

Z is selected from the group consisting of O, S, N, C, CH, C_6H_3, C_6H_4, C_aH_b, $C_6H_{10}O_2$, and $C_aH_bO_m$, wherein a, b, and m are integers;

R is selected from the group consisting of absent, hydrogen, oxygen, an alkyl, a hydroxy, an aryl, an aliphatic group, an aromatic group, an acyl group, an alkoxy group, an alkylene group, an alkenylene group, an alkynylene group, a hydroxycarbonylalkyl group, an anhydride, a halide, an amide, an amine, and a heterocyclic aromatic group; and

n is an integer greater than or equal to one, denoting the degree of polymerization.

167. (NEW) The ascorbyl coupled polymer of claim 166, wherein at least 1% of the polymer comprises the functionalized units.

168. (NEW) The ascorbyl coupled polymer of claim 166, wherein at least 10% of the polymer comprises the functionalized units.

169. (NEW) The ascorbyl coupled polymer of claim 166, wherein at least 50% of the polymer comprises the functionalized units.